

INSTRUCTIONS FOR BUILDING A BIODIESEL PROCESSOR BY UTAH BIODIESEL SUPPLY



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Biodiesel Processor Diagram:

[Click Here](#) to download a detailed diagram for building this Biodiesel Processor. (252 Kb Adobe Acrobat File)

Introduction:

On this page we will walk you through the steps to build a Water Heater Based Biodiesel Processor. This project takes about 6 hours to complete and when completed is ready for use.

Design Credit:

The Riverstones (TM) Biodiesel Processor is based off of an open source [Appleseed Processor design](#) created by [Maria "Mark" Alovert](#). Our design add's to the basic concept and implements some improvements to make processing biodiesel safe and easy. The basic design uses an electric water heater, some basic off-the-shelf plumbing, a water pump, and some tubing.

This design allows for an effective but simple way to make biodiesel.
It also is a great compliment to our [Biodiesel Wash Tank](#).

Tools Needed:

Black Permanent Marker
(2) Pipe Wrenches
[Water Heater Element Wrench](#)
Phillips Head Screwdriver
Utility Knife
Measuring Tape
Heat Gun
[Tubing Cutter](#)
Petroleum Jelly
Needle Nose Pliers

Supplies Needed:

[Click here for a printable version of this list](#)

- (1) 30, 40, 50, or 80 Gallon Electric Water Heater
 - *We recommend GE Brand Electric Water Heaters commonly available from Home Depot*
- (1) [1" Clear Water Pump](#)
- (1) [12 Gauge Electric Power Cord](#)
- (1) [14 Gauge Electric Power Cord](#)
- (1) [1500 Watt Water Heater Element](#)
- (1) [5 Gallon/20 Liter Carboy](#)
- (1) [10 Ft 1/2" Inner Diameter Thick Wall Poly Tubing](#)
- (1) [10 Ft 3/4" Inner Diameter Thick Wall Poly Braided Tubing](#)
- (5) [1/2 - 1 1/4" Stainless Steel Gear Clamp](#)
- (6) [Rolls 1/2" Yellow Teflon Tape](#)
- (1) [1/2" MPT Dial Type Thermometer](#)

Plumbing Fittings

- (1) [1" Black Steel Close Nipple](#)

3/4" Fittings

- (1) [3/4" 30 PSI Pressure Relief Valve](#)
- (2) [3/4" MPT X 3/4" Hose Barb Quick Release Cam Lock](#)
- (1) [3/4" MPT X 1/2" Hose Barb Quick Release Cam Lock](#)
- (4) [3/4" Barb X 3/4" MPT Poly Fitting](#)
- (8) [3/4" Brass Threaded Full Port Ball Valve](#)
- (1) [3/4" Threaded Black Steel Union](#)
- (1) [1" X 3/4" Black Steel Bushing](#)
- (2) [3/4" 90° Black Steel Street Elbow](#)
- (3) [3/4" 90° Black Steel Elbow](#)
- (1) [3/4" X 12" Black Steel Pipe](#)
- (2) [3/4" X 9" Black Steel Pipe](#)
- (6) [3/4" X 3" Black Steel Pipe](#)
- (1) [3/4" X 3/4" X 3/4" Black Steel Tee](#)
- (3) [3/4" X 3/4" X 1/2" Black Steel Tee](#)
- (1) [3/4" X 1/2" X 3/4" Black Steel Tee](#)
- (1) [3/4" X 1" X 3/4" Black Steel Tee](#)

[\(9\) 3/4" Black Steel Close Nipple](#)

1/2" Fittings

[\(3\) 1/2" Barb X 1/2" MPT Poly Fitting](#)

[\(3\) 1/2" Brass Full Port Threaded Ball Valve](#)

[\(1\) 1/2" Black Steel Swing Check Valve](#)

[\(1\) 1/2" X 9" Black Steel Pipe](#)

[\(2\) 1/2" 90° Black Steel Street Elbow](#)

[\(3\) 1/2" Black Steel Close Nipple](#)

Assembly Instructions:

Click on any of the pictures below to see larger versions

Before getting started you'll need to obtain an electric water heater to build a Biodiesel Processor from. Most 30, 40, 50, or 80 gallon electric water heaters will work with these instructions. We've had great luck using GE Branded electric water heaters which are commonly available at most home improvement stores including The Home Depot.

Using a new water heater makes building a biodiesel processor a little easier. Because it's new, you don't have to worry about leaks or about cleaning out any possible sludge or water deposits. It's possible to build processors from used water heaters but we've just found it easier to use new ones.

Let's Get Started!

Clicking on any of the pictures below will open a larger version of the image.

Step 1 - Lay Out All The Parts

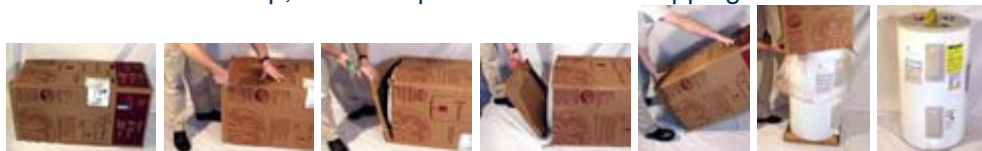


Above is a picture of all the parts you'll be using to assemble the processor.

Step 2 - Unpack The Water Heater

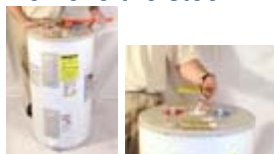
Once you've laid out your parts it's time to open the water heater.

Lay the box on it's side, cut along the cutting line, remove the bottom, stand the box back up, and then pull the box and wrapping off the water heater.



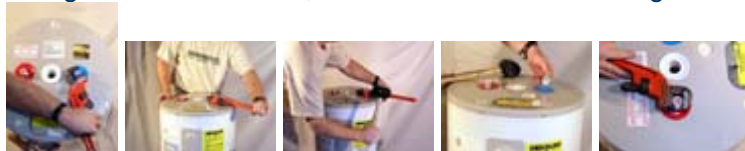
Step 3 - Remove Stock Relief Valve

Remove the stock Pressure Relief Valve by using a large pipe wrench.



Step 4 - Remove Hot & Cold Inlet Nipples

Remove the stock di-electric hot & cold water inlet nipples by using a large pipe wrench. You may need to use a hammer to break them loose. Be sure the wrench clamps tight on the fitting. Using the same method, remove the hot water fitting too.



Step 5 - Remove Cold Water Dip Tube

If you look down the cold water inlet tube you'll see a plastic tube.

- Place an index finger into the cold water inlet
- Press against the side of the tube
- Twist the tube around inside until it comes loose
- Keeping pressure on the side, pull up on the tube
- Pull the tube all the way out and discard



Step 6 - Remove Plastic Inserts

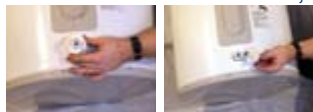
Remove the plastic inserts on top using a pair of needle nose pliers and a hammer.



Step 7 - Remove Lower Drain

Remove the plastic drain at the bottom of the tank.

First unscrew the valve, then using a wrench remove the drain.





Step 8 - Lay Out Plumbing

Using the [diagram provided](#), lay out the lower plumbing near the water heater in the way it will be assembled.



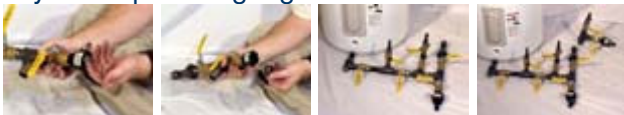
Step 9 - Assemble Lower Plumbing

Using the [diagram provided](#), lay out the plumbing near the water heater in the way it will be assembled.



Step 10 - Replace Quick Connect Seals & Connect Plumbing

Remove the seal inside the quick connect and replace them with the included Viton seal. Dry fit the plumbing together near the base of the water heater.



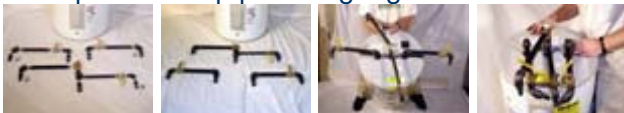
Step 11 - Unpack Pump & Dry Fit To Plumbing

Unpack the processor pump and connect it to the plumbing to ensure a good fit.



Step 12 - Layout Top Plumbing & Connect To Water Heater

Layout the top plumbing in front of the water heater and dry fit it together. Then attach it to the top of the water heater, leaving the connections loose. (Note: The ball valves will go out at the ends of the pipes) Then push the top plumbing together.



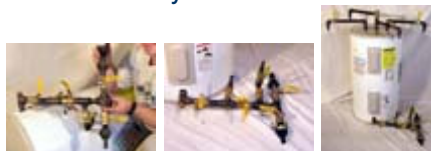
Step 13 - Connect Lower Plumbing

Lay the water heater on it's side
Unscrew the methoxide part of the manifold
Lightly screw the rest of the manifold into the lower drain
Screw the methoxide manifold back onto the rest of the plumbing



Step 14 - Connect Lower Pump Manifold

With the water heater on it's side, screw on the lower pump manifold
Then carefully stand the water heater back up.



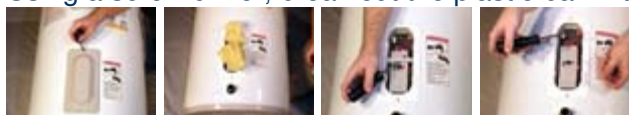
Step 15 - Connect Upper Pump Manifold & Pump

Screw the upper pump manifold into the pump and connect the pump to the manifold



Step 16 - Lower Element Modification

Unscrew the lower element cover & remove the fiberglass
Using a screw driver, break out the plastic bar in the middle



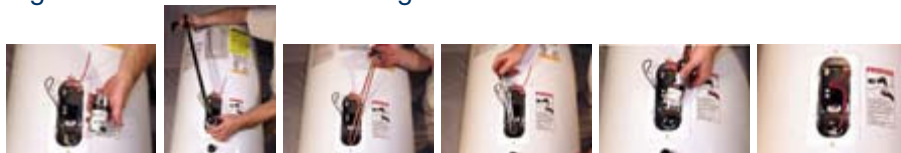
Step 17 - Lower Element Wiring

Remove the plastic cover from the element assembly
Loosen the screws on the lower element and pull the wiring off



Step 18 - Changing Element To 120 Volt

Using an element wrench, unscrew the lower element
Remove the lower element and replace it with the included 1500 Watt element
Tighten the new element and reattach the wiring to the new element
Tighten the screws on the wiring on the new element



Step 19 - Setting Lower Element Thermostat

Using a small screwdriver, set the thermostat to just above 125 ° F.
You'll calibrate the thermostat to 130 ° later.



Step 20 - Close Up Lower Element

Replace the plastic cover, the fiberglass insulation, and screw on the cover



Step 21 - Open Upper Element

Unscrew the upper element, remove the fiberglass insulation,

and pop out the plastic center and remove the plastic cover.



Step 22 - Modify Element Wiring

Unscrew the wiring from the element

Pull the wiring away from the element

Unscrew the wires from the thermostat that connected to the element



Step 23 - Wiring Upper Element Area

Pick up one of the wires you just removed

Using needle-nose pliers, bend the end into an L shape

Connect the end you bent to the second screw from the top on the left

Bend the other side of the wire into an L shape

Connect it to the third screw down on the right

This will effectively by-pass the upper heating thermostat.

We do this on purpose so that only the lower element and thermostat are operational



When done it should look like the picture below



Step 24 - Close Up The Upper Element Housing

Place the plastic cover back on the thermostat

Place the insulation back in the housing

Reattach the cover and screw it back on

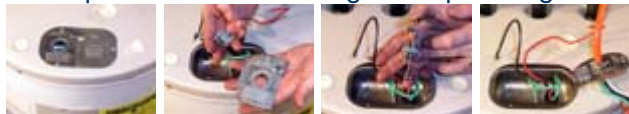
**Step 25 - Preparing Upper Wiring**

Remove the wiring cover on top of the water heater

Unscrew the cord clamp and attach it to the wiring cover

Tighten the clamp locking nut

Place processor cord through clamp and tighten the clamp on cord

**Step 26 - Wiring Processor Cord**

Put both black wires together and screw on a yellow wiring connector

Place the white and red wires together and connect with a yellow wiring connector

**Step 27 - Connecting The Ground**

Connect the green wire to the grounding screw

Be sure all the wires are tight and press them back into the junction box

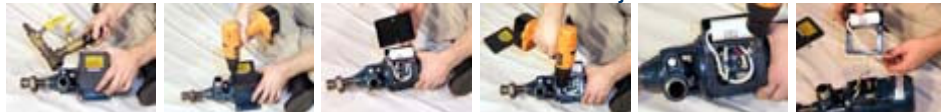
Attach the junction box covers back to the water heater and screw them down

**Step 28 - Pump Wiring - Starting**

Remove the pump from the plumbing & remove the top pump manifold

Unscrew the screws on the top cover and pull the cover off

Unscrew the inner screws and remove the black junction box

**Step 29 - Pump Wiring - Wire Clamp**

Unscrew the wire clamp and remove

**Step 30 - Pump Wiring - Preparing The Gromet**

Pull the rubber gromet off of the pump

Using a knife, cut a slit in the gromet and pull the slit open

Insert the pump cord through the gromet as shown



Step 31 - Pump Wiring - Attaching The Cord

Insert the wiring through the hole in the pump

Using a screw driver, carefully push the grommet back into place



Step 32 - Pump Wiring - Attaching Connectors

Attach blue wiring connectors to all three wires on the cord

Using a crimper, crimp the connectors to the wires

Using needle-nose pliers, unscrew the wiring nuts

Attach the black cord wire to the left connector

Attach the white cord wire to the right connector

Place the wiring nuts back onto the posts and tighten down snug



Step 33 - Pump Wiring - Attaching Ground

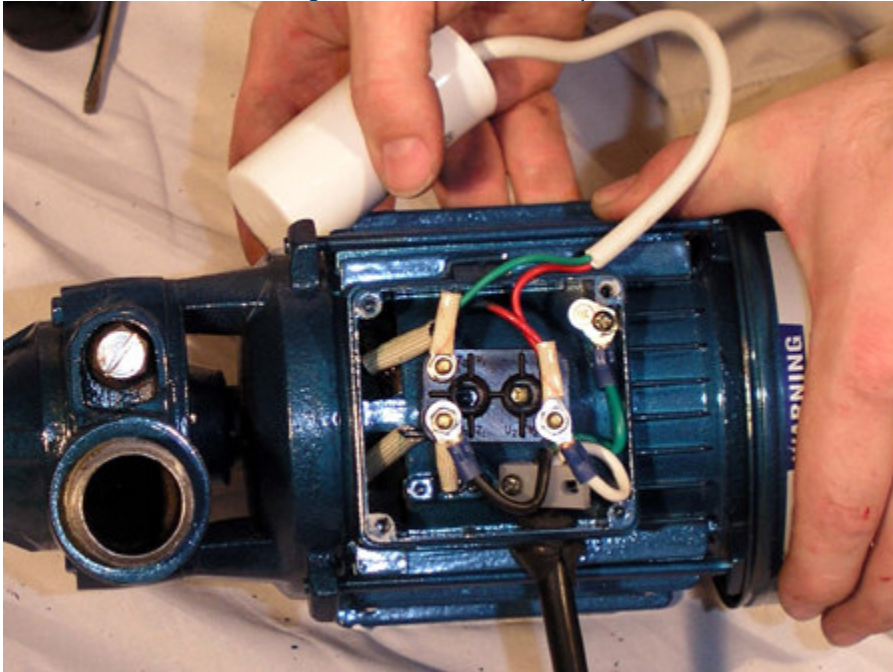
Unscrew the ground connection with a screw driver

Connect the green cord wire to the screw and screw it back down



Step 34 - Pump Wiring - Wiring Complete

When finished, the wiring should look like the picture below



Step 35 - Pump Wiring - Reattach Junction Box

Reattach the wiring junction box back onto the pump

Replace the junction box cover and screw everything back down



Step 36 - Reattach Pump To Plumbing

Reattach the pump to the lower plumbing manifold

The processor should look very similar to the picture below



Step 37 - Sizing 3/4" Pump Tubing

Grab the roll of 3/4" Poly Braided Tubing that came with the kit

Using a measuring tape, measure from the upper pump hose barb to the hose barb above it

Measure at the bottom of the hose barb (where the tubing would be when it's on)

Record the measurement and cut a length of 3/4" hose to that length



Step 38 - Attaching 3/4" Pump Tubing

NOTE: Only attach tubing AFTER you've teflon taped & tightened all of the plumbing removing hoses from the hose barbs is extremely difficult once they're attached.

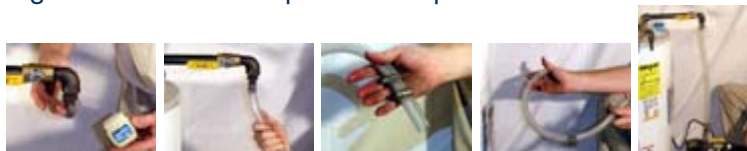
Also, using a heat gun can significantly speed up attaching the tubing.

To do so, heat the end of the tubing to be placed on the barb and then push

Rub some petroleum jelly on the hose barbs to make putting them on easier

Press the tubing on the top hose barb & place two hose clamps onto the tubing

Press the tubing onto the lower hose barb
Tighten the hose clamps on the top & bottom hose barbs



Step 39 - Sizing 1/2" Site Tube

As above, measure the length from the top & bottom site tube hose barbs
Grab the roll of 1/2" Thick Wall Clear Tubing
Use petroleum jelly to lubricate the hose barbs
Cut the tubing to the length and attach to top hose barb
Place two hose clamps on the tubing and attach tubing to lower hose barb
Attach tubing to lower hose barb and tighten the hose clamps
the tubing onto the hose barb.



Step 40 - Assembling The Carboy Tube

Punch out the center Carboy Lid.
Attach the 3/4" Male Thread Camlock to the Carboy Lid
Remove the Camlock and apply teflon tape to it



Reattach the camlock
Attach the methoxide tube to the 1/2" Camlock Hose Barb
Slide the clamp onto the tube and tighten onto the hose barb
Attach the assembly into the Camlock



Step 41 - Metering The Carboy

Fill a 2 liter container full of water and pour it into the carboy.
Using a black marker, mark the water line and label it **2**



Repeat the process until the carboy is metered to 10 liters.



Continue to fill the carboy, but now do so in 1 liter increments, marking at each liter.
Repeat this process until the carboy is marked to 20 liters.



Step 42 - Metering The Processor

NOTE: As the metering occurs, watch for leaks in the plumbing on the processor. Note any leaks so that they can be fixed after metering has occurred

Fill the metered carboy to the 20 liter mark

Attach the carboy lid and attach the lid to the methoxide assembly



Close the valve between the site tube and methoxide tube.



Open the site tube valves.

Turn on the pump and allow the water in the carboy to transfer to the processor



NOTE: Usually the first 20 liters will not register on the site tube.

Fill the carboy again to the 20 liter mark and reattach to the processor and add it to the processor.



After filling the processor the second time, watch for the water level to begin appearing on the site tube.

Allow the water to level and then mark the tube as 40 liters.

Repeat the process of filling the tank and marking the site tube until the water level is about 6" from the top.



After the tank is full, remove the carboy from the assembly.

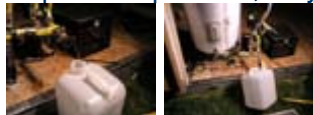
Remove the carboy lid and place the carboy opening under the processor drain.

Open the processor drain and drain off 10 liters of water

Mark the site tube, which will have fallen 10 liters from the top mark.



Repeat the process, only this time remove a full 20 liters and mark the tube again.



Step 43 - Emptying The Processor

The processor tank will need to be completely emptied prior to it's first batch after metering

Empty the carboy all the way, place under the drain and open the drain valve.



Using two people, very carefully tip the processor tank forward so that the remaining water will drain from the tank



Carefully continue to tilt the tank forward until the water has completely drained out. Then tilt the tank back up.

Step 44 - Fix Any Leaks

If any leaks were noted while metering the tank, tighten or re-teflon tape the fittings and retighten any leaking fittings.

Step 45 - Preparing For Processing

Move the processor to it's permanent area and tighten everything down. You may want to refill the tank with water to ensure there are no leaks if the plumbing was moved around a great deal. Attach the vent hose and connect it to an outside area.

Step 46 - Processing Biodiesel

Congratulations! Your processor is now complete and ready to brew Biodiesel. For a great set of detailed instructions on brewing biodiesel, click on the link below [Click Here For Step By Step Instructions](#)

Enjoy your new Biodiesel Processor!

COMPLETED PROCESSORS

Be sure to check out our processor photo gallery section. We've taken pictures of some of the equipment we've custom built for customers. [Click Here](#) for the photo gallery!

EXTRA BONUS MATERIAL

[Pictures Of A Biodiesel Processor Cart](#)

- We built a really nice cart once for a customer to attach the processor we built for him.
- You can see more of the completed processor by [Clicking Here](#)

[275+ Extra Pictures](#)

- Photo gallery of all the pictures we used to build these plans

[300+ Processor Building Pictures](#)

- Photo gallery from an earlier biodiesel processor building photo shoot
- Lot's of great close-ups of plumbing, wiring, processor fittings and more!

[20 Pictures Of Plumbing Lay Outs](#)

- Several pictures of the plumbing layout used for our processors.
- There's some subtle differences in layouts versus what our plans call for. Great visuals though!

[100+ Older Style Biodiesel Processor Pictures](#)

- 100+ pictures of an older style biodiesel processor we used to build
 - The plumbing layout on this unit is quite different, but the close-up pictures are great!
 - Includes an original sketch for our current design!
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